MARKED-UP VERSION OF THE AMENDED SPECIFICATION

Paragraph 2, page 6, (second amendment) has been amended as follows:

The essence of the invention comprises [image] <u>imaging</u> illuminating surfaces onto the surface of the object to be measured. The impingement of the surface of the object to be measured occurs from the most different directions of incidence by employing a diffusely illuminating surface instead of a sharply bundled laser beam. The course of beams out of an illuminating surface, wherein the course of beams is focused on the surface of the container, contains a large bandwidth of light bundles, which impinge onto the container surface from different angles of incidence. This assures that parts of the course of the beams are always reflected back into the receiving optics despite the grained, uneven surface of the object to be measured, even though other bundles out of the beam course are not available based on these surface defects. Thus always two reflexes are generated on the opto-electronic image resolving sensor.

PAGE 8, PARAGRAPH 3 (second amendment)

Paragraph 3, page 8, (second amendment) has been amended as follows :

At the same time the lens 22 is disposed following to the illuminating surface 21, wherein the illuminating surface 21 is again realized by a line shaped light exit opening of a light guide. Again this lens generates a parallel beam from the diverging beam which exits from the light guide 21, wherein the parallel beam is directed to the semi permeable mirror 23 into the objective 24, wherein the objective 24 also focuses the beams under an angle of incidence onto the surface of the container 1. This angle incidence corresponds to the exit angle <u>from the surface of the container 1</u> of the reflexes <u>derived</u> from the first illuminating surface 11. Similarly two reflexes derived from the front side 1.1 and from the inner side <u>or rear side</u> 1.2 of the container are reflected back from the surface of the container 1. These two reflexes are imaged through the objective 14, through the semi permeable mirror 13 and further through the lens 15 onto the line sensor 16. The line sensor 16 is again connected to the controller 3, wherein the controller 3 also determines the distance between these two reflexes and uses the distance between these two reflexes as a base for the further calculation of the wall thickness. The wall thickness is finally determined by an averaging of the distances determined with the two sensors 16 and 26.

MARKED-UP VERSION OF THE AMENDED CLAIMS

(Version with markings to show changes made)

1. (three times amended) A method for contactless measurement of a wall thickness of a transparent object by employing of light sources, lenses, deflection mirrors or deflection prisms, semi permeable mirrors as well as line sensors and a controller, characterized in that light from a first illuminating surface (11) is initially collimated and in the following focused onto a surface of the transparent object (1) with an angle of incidence relative to a normal of the surface, wherein two reflexes of light occurring at a front side (1.1) and at [an inner] <u>a rear</u> side (1.2), are imaged furthermore onto a [first] <u>second</u> opto-electronic image resolving sensor (26) and wherein light from a second illuminating surface (21) is also simultaneously collimated initially and in the following focused in the direction toward the surface of the transparent object (1), wherein the direction toward the surface of the transparent object (1) corresponds to an exit direction of the light from the first illuminating surface (11), and wherein [furthermore] reflexes of light are imaged onto [the] <u>a</u> second opto-electronic image resolving sensor (16) and wherein the average value of distances between respective two reflexes on each of the two opto-electronic image resolving sensors is evaluated as a measure of the wall thickness in a following disposed controller (3).

2. (three times amended)[Device] <u>A device</u> for contactless measurement of wall thickness of a transparent object <u>(1)</u> employing light sources, lenses, semi permeable

mirrors or semi permeable prisms as well as image resolving sensors and a controller, characterized in that a first lens (12) is disposed following to a first illuminating surface (11), wherein a first semi permeable mirror (13) is disposed behind the first lens (12) in such a way that light is reflected into [an] a first objective (14) and is further focused onto the transparent object (1) and wherein [furthermore an] a second objective (24) is disposed such that the second objective (24) together with a fourth lens (25) images beams reflected at the transparent object (1) onto a second sensor (26) through a second semi permeable mirror (23) and wherein a second lens (22) is simultaneously coordinated to a second illuminating surface (21), wherein [the] a second semi permeable mirror (23) is disposed following to the second lens (22) in such a way that light from the second illuminating surface (21) is focused also onto the transparent object (1), wherein the direction of incidence of light corresponds to an exit direction of light from the first illuminating face and wherein reflexes are imaged onto a first sensor (16) through the first objective (14), wherein a controller (3) is connected to the two sensors (16 and 26) [(16) and (26)].

3. (twice amended) [Device] The device according to claim 2, characterized in that the first illuminating suface [surfaces] (11) and the second illuminating surface (21) are light exit openings of light guides.

4. (amended) [Device] The device according to claim [2 and] 3, characterized in that the respective light exit opening of the light guides is formed of line shape.

5. (twice amended) [Device] The device according to claim 2 characterized in that the first illuminating surface [surfaces] (11) and the second illuminating surface (21) are furnished with lasers and with beam expansion optics.

6. (twice amended) [Device] The device according to claim 2, characterized in that the first illuminating surface [surfaces] (11) and the second illuminating surface (21) are furnished by light sources with predisposed slot diaphragms.

7. (amended) [Device] A devicee for contactless measurement of wall thickness of container glass of transparent object (1) with a front side (1.1) and an inner side (1.2) comprising

a first illuminating surface (11) and a second illuminating surface (21) for generating diverging light beams;

a first lens (12) and a second lens (22) for generating parallel light beams from the diverging light beams generated by the illuminating surfaces (11) and (21) respectively;

a first semi-permeable mirror (13) for selective light beam reflection or transmission;

a second semi-permeable mirror (23) for selective light [beams] beam reflection or transmission;

a first objective (14) and a second objective (24) for focusing and generating parallel light beams;

a first sensor (16) and a second sensor (26);

a third lens (15) and a fourth lens (25) for focusing light beams onto the first sensor (16) and the second sensor (26) respectively;

a controller (3) for averaging values determined by the first sensor (16) and the second sensor (26).

8. (amended) A method for performing contactless measurement of a wall thickness of transparent container glass comprising

generating diverging light beams with a first illuminating surface (11) and with a second illuminating surface (21);

generating parallel light beams from the diverging light beams with a first lens (12) and with a second lens (22) and directing the generated parallel light beams by reflection from a first semipermeable mirror (13) and from a second semipermeable mirror (23);

focusing the directed parallel light beams onto a transparent object (1) having a front side (1.1) and [an inner] a rear side (1.2)

reflecting focused parallel light beams from the front side (1.1) and the [inner] rear side (1.2);

generating parallel light beams from the diverging light beams reflected by the front side (1.1) and by the [inner] rear side (1.2) by a first objective (14) and by a second objective (24);

focusing the parallel light beams with a fourth lens (25) and with a third lens (15) and obtaining light values of [reflected] focused parallel light beams with a second sensor (26) and with a first sensor (25);

analyzing obtained light values; and

determining a wall thickness of the transparent object (1) with a controller (3).

11. (amended) A device for contactless measurement of a wall thickness of a container glass being a transparent object (1) with a front side (1.1) and a rear side (1.2) comprising

a first illuminating surface (11) for generating first diverging light beams;

a first lens (12) disposed in the area of the first diverging light beams and for generating first parallel light beams from the diverging light beams generated by the first illuminating surface (11);

a first semi-permeable mirror (13) disposed in a path of the first parallel light beams for reflecting the first parallel light beams;

a first objective (14) disposed in a path of reflected first parallel light beams for focusing the reflected first parallel light beams in the area of the front side (1.1) and rear side (1.2) of the transparent object (1);

a second objective (24) disposed in a path of first light beams reflected in the area of the front side (1.1) and rear side (1.2) of the transparent object (1) for [focusing] <u>collimating</u> the first light beams into third parallel light beams;

a second semi-permeable mirror (23) disposed in a path of the third parallel light beams for passing the third parallel light beams;

a second sensor (26);

a fourth lens (25) disposed in the path of the third parallel light beams for focusing the third parallel light beams onto the second sensor (26);

a second illuminating surface (21) for generating second diverging light beams;

a second lens (22) disposed in the area of the second diverging light beams and for generating second parallel light beams from the second diverging light beams generated by the second illuminating surface (21);

wherein the second semi-permeable mirror (23) is disposed in a path of the second parallel light beams for reflecting the second parallel light beams;

wherein the second objective (24) is disposed in the path of the reflected second parallel light beams for focusing the reflected second parallel light beams in the area of the front side (1.1) and rear side (1.2) of the transparent object (1);

wherein the first objective (14) is disposed in a path of second light beams reflected in the area of the front side (1.1) and rear side (1.2) of the transparent object (1) for [focusing] <u>collimating</u> the second light beams into fourth parallel light beams;

wherein the first semi-permeable mirror (13) <u>is</u> disposed in a path of the fourth parallel light beams for passing the fourth parallel light beams;

a first sensor (16);

a third lens (15) disposed in the path of the fourth parallel light beams for focusing the fourth parallel light beams onto the first sensor (16);

a controller (3) connected to the first <u>line</u> sensor (16) and connected to the second <u>line</u> sensor (26) for averaging values determined by the first <u>line</u> sensor (16) and determined by the second <u>line</u> sensor (26).

19. (amended) A method of contactless measurement of a wall thickness of container glass being a transparent object (1) with a front side (1.1) and a rear side (1.2) comprising the steps of:

generating first diverging light beams on a first illuminating surface (11);

generating first parallel light beams from the diverging light beams generated by the first illuminating surface (11) with a first lens (12) disposed in the area of the first diverging light beams;

reflecting the first parallel light beams with a first semi-permeable mirror (13) disposed in a path of the first parallel light beams;

focusing reflected first parallel light beams in the area of the front side (1.1) and rear side (1.2) of the transparent object (1) with a first objective (14) disposed in a path of the reflected first parallel light beams;

[focusing] <u>collimating</u> [the] first light beams into third parallel light beams with a second objective (24) disposed in a path of first light beams reflected in the area of the front side (1.1) and rear side (1.2) of the transparent object (1);

passing the third parallel light beams through a second semi-permeable mirror (23) disposed in a path of the third parallel light beams;

focusing the third parallel light beams onto a second sensor (26) with a fourth lens (25) disposed in the path of the third parallel light beams;

generating second diverging light beams with a second illuminating surface (21);

generating second parallel light beams from the second diverging light beams generated by the second illuminating surface (21) with a second lens (22) disposed in the area of the second diverging light beams;

reflecting the second parallel light beams with the second semi-permeable mirror (23) disposed in a path of the second parallel light beams;

focusing the reflected second parallel light beams in the area of the front side (1.1) and rear side (1.2) of the transparent object (1) with the second objective (24) disposed in the path of the reflected second parallel light beams;

[focusing] <u>collimating</u> second light beams reflected in the area of the front side (1.1) and rear side (1.2) of the transparent object (1) into fourth parallel light beams with the first objective (14) disposed in a path of <u>the</u> second light beams ;

passing the fourth parallel light beams through the first semi-permeable mirror (13) disposed in a path of the fourth parallel light beams;

focusing the fourth parallel light beams onto a first sensor (16) with a third lens (15) disposed in the path of the fourth parallel light beams;

averaging values determined by the first line sensor (16) and determined by the second line sensor (26) in a controller (3) connected to the first line sensor (16) and connected to the second line sensor (26).

21. (new) The method according to claim 19 further comprising
impinging onto the object (1) from different angles of incidence with the reflected first parallel light beams focused in the area of the front side (1.1) and rear side (1.2) of the transparent object (1); and
impinging onto the object (1) from different angles of incidence with the reflected second parallel light beams focused in the area of the front side (1.1) and rear side (1.2) of the transparent object (1).

22. (new) The method according to claim 19 further comprising
entering parts of the first light beams reflected in the area of the front side (1.1) and rear side (1.2) of the transparent object (1) into the second objective (24) despite a grained, uneven surface of the object and even though other parts of the first light beams are not available based on surface defects of the object (1); and
entering parts of the second light beams reflected in the area of the front side (1.1) and rear side (1.2) of the transparent object (1) into the first objective (24) despite a grained, uneven surface of the object and even though other parts of the second light beams are not available based on surface defects of the object (1).

23. (new) A method according to claim 8 wherein the semi-permeable mirror (13) performs reflecting and directing light beams generated by the first illuminating surface (11) and transmission of light beams generated by the second illuminating surface (21) and further reflected from the front side (1.1) and the rear side (1.2) of the transparent

object (1); wherein the semi-permeable mirror (23) performs reflecting and directing light beams generated by the second illuminating surface (21) and transmission of light beams generated by the first illuminating surface (11) and further reflected from the front side (1.1) and the inner side (1.2) of the transparent object (1).

24 (new) A method for contactless measurement of a wall thickness of a transparent object by employing of light sources, lenses, deflection mirrors or deflection prisms, semi permeable mirrors as well as line sensors and a controller, characterized in that light from a first illuminating surface (11) is initially collimated through a first lens (12) and in the following through a first semi-permeable mirror (13) and further through a first objective (14) focused onto a surface of the transparent object (1) with an angle incidence relative to a normal of the surface, wherein two reflexes of light, which reflexes occur at a front side (1.1) and at a rear side (1.2), are imaged through a second objective (24), through a second semi-permeable mirror (23) and further through a forth lens (25) furthermore onto a second opto-electronic image resolving sensor (26) and wherein light from a second illuminating surface (21) is simultaneously also initially collimated through a second lens (22) and in the following through a second semi-permeable mirror (23) and further through the second objective (24) focused in the direction toward the surface of the transparent object (1), wherein the direction toward the surface of the transparent object (1) corresponds to the exit direction of the light from the first illuminating surface (11), and wherein furthermore reflexes of light are imaged through the first objective (14), through the first semi-permeable mirror (13) and further through a third lens (15) onto a first opto-electronic image resolving sensor (16) and wherein the average value of the distances of the respective two reflexes on the two opto-electronic image resolving sensors is evaluated as a measure of the wall thickness in a following disposed controller (3).

25. (new) A method of contactless measurement of a wall thickness of container glass being an object (1) with a front side (1.1) and a rear side (1.2) comprising the steps of:

generating first diverging light beams on a first illuminating surface (11);

collimating the diverging light beams generated by the first illuminating surface (11) for generating first parallel light beams;

passing the first parallel light beams by a first optical beam splitter (13) disposed in a path of the first parallel light beams;

focusing first parallel light beams having passed the first optical beam splitter (13) in the area of the front side (1.1) and rear side (1.2) of the transparent object (1) with a first optical focusing and in reverse collimating system (14) disposed in a path of the first parallel light beams having passed the first optical beam splitter (13);

collimating first light beams reflected from the object (1) into third parallel light beams with a second optical focusing and in reverse collimating system (24) disposed in a path of first light beams reflected in the area of the front side (1.1) and rear side (1.2) of the object (1);

passing the third parallel light beams through a second optical beam splitter (23) disposed in a path of the third parallel light beams;

focusing the third parallel light beams onto a second light incidence position resolving sensor (26);

generating second diverging light beams with a second illuminating surface (21);

collimating the second diverging light beams generated by the second illuminating surface (21) for generating second parallel light beams;

passing the second parallel light beams by the second optical beam splitter (23) disposed in a path of the second parallel light beams;

focusing the second parallel light beams after passing the second optical beam splitter (23) in the area of the front side (1.1) and rear side (1.2) of the transparent object (1) with the second optical focusing and in reverse collimating system (24) disposed in the path of the second parallel light beams;

collimating second light beams reflected in the area of the front side (1.1) and rear side (1.2) of the transparent object (1) into fourth parallel light beams with the first optical focusing and in reverse collimating system (14) disposed in a path of the second light beams;

passing the fourth parallel light beams through the first optical beam splitter (13) disposed in a path of the fourth parallel light beams;

focusing the fourth parallel light beams onto a first light incidence position resolving sensor (16);

averaging values determined by the first light incidence position resolving sensor (16) and determined by the second light incidence position resolving sensor (26) in a controller (3) connected to the first light incidence position resolving sensor (16) and connected to the second sensor (26).

26. (new) The device, according to claim 7, characterized in that diverging light beams are generated by the first illuminating surface (11) and the second illuminating surface (21); wherein diverging light beams generated by the first illuminating surface (11) converted to parallel light beams through the first lens (12), reflected into the direction of the first objective (14) through the first semi-permeable mirror (13), further through the first objective (14) are focused onto the transparent object (1) and wherein diverging light beams generated by the second illuminating surface (21) converted to parallel light beams through the second lens (22), reflected into the direction of the second objective (24) through the second semi-permeable mirror (23), further through the second objective (14) are focused onto the transparent object (1); wherein focused light beams passing from the first objective (14) and reflected from the transparent object (1) and consisting of reflexes from the front side (1.1) and the inner side (1.2) are imaged through the second objective (24), through the second semi-permeable mirror (23) and further through the forth lens (25) onto the second sensor (26) and wherein focused light beams passing from the second objective (24) and reflected from the transparent object (1) and consisting of reflexes from the front side (1.1) and the inner side (1.2) are imaged through the first objective (14), through the first semi-permeable mirror (13) and further through the third lens (15) onto the first sensor (16); wherein the controller (3) connected to the first sensor (16) and the second sensor (26) determines the distance of reflexes on the first sensor (16) and the second sensor (26) and finally determines the wall thickness

of the transparent object (1) by averaging of the distances of the reflexes on the two sensors (16, 26).

27. (new) A device for contactless measurement of a wall thickness of an object (1) with a front side (1.1) and a rear side (1.2) comprising

a first illuminating surface (11) for generating first diverging light beams;

a first optical collimator (12) disposed in the area of the first diverging light beams and for generating first parallel light beams from the diverging light beams generated by the first illuminating surface (11);

a first optical beam splitter (13) disposed in a path of the first parallel light beams for passing the first parallel light beams;

a first optical focusing and in reverse collimating system (14) disposed in a path of passed first parallel light beams for focusing the passed first parallel light beams in the area of the front side (1.1) and rear side (1.2) of the transparent object (1);

a second optical focusing and in reverse collimating system (24) disposed in a path of first light beams reflected in the area of the front side (1.1) and rear side (1.2) of the object (1) for collimating the first light beams into third parallel light beams;

a second optical beam splitter (23) disposed in a path of the third parallel light beams for passing the third parallel light beams;

a second light incidence position resolving sensor (26);

a fourth optical focusing system (25) disposed in the path of the third parallel light beams for focusing the third parallel light beams onto the second light incidence position resolving sensor (26);

a second illuminating surface (21) for generating second diverging light beams;

a second optical collimator (22) disposed in the area of the second diverging light beams and for generating second parallel light beams from the second diverging light beams generated by the second illuminating surface (21);

wherein the second optical beam splitter (23) is disposed in a path of the second parallel light beams for passing the second parallel light beams;

wherein the second optical focusing and in reverse collimating system (24) is disposed in the path of the passed second parallel light beams for focusing the passed second parallel

light beams in the area of the front side (1.1) and rear side (1.2) of the transparent object (1);

wherein the first optical focusing and in reverse collimating system (14) is disposed in a path of second light beams reflected in the area of the front side (1.1) and rear side (1.2) of the transparent object (1) for collimating the second light beams into fourth parallel light beams;

wherein the first optical beam splitter (13) is disposed in a path of the fourth parallel light beams for passing the fourth parallel light beams;

a first light incidence position resolving sensor (16);

a third optical focusing system (15) disposed in the path of the fourth parallel light beams for focusing the fourth parallel light beams onto the first light incidence position resolving sensor (16);

a controller (3) connected to the first light incidence position resolving sensor (16) and connected to the second light incidence position resolving sensor (26) for averaging values determined by the first light incidence position resolving sensor (16) and determined by the second light incidence position resolving sensor (26).

REMARKS

Claims 1 through 20 continue to be in the case.

New claims 20 through 27 are being submitted.

New claim 21 is based on the language of claim 13.

New claim 22 is based on the language of claim 14.

New claim 23 is based on the specification and on the drawing.

New claim 24 is based on claim 1 with added structural parts.

New claim 25 is based on claim 19 and the drawings and the specification.

New claim 26 is based on the drawings.

New claim 27 is based on claim 11 and the drawings and the specification.

The Office Action refers to Claim Rejections - 35 USC § 103.

13. Claims 1-8 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Spengler et al (US 5.636,027) in view of Takamasa (JP 58022902) and further in view of what is commonly known in the art.

Spengler et al (Spengler hereinafter) discloses a method and apparatus comprising all the claim limitations (see col.3, line 36- col.4, line 10, Figure 1) except the use of lasers as a light sources instead of applicants use of "light surfaces", and the use of lenses for shaping the light beams, for the purpose of making contactless measurement of the thickness of an object made of transparent material.

The Office Action of the October 24, 2002 recites the references United States patent 5,636,027 to Spengler et al. and Japanese patent 58, 022, 902 (Takamasa).

The following is to show the difference between the present Invention relative to the recited state-of-the-art in the United States patent and the Japanese patent.

The present invention is predominantly suitable for a measurement of a wall thickness of container glass with rough and uneven surfaces typical for such container glass.

The device of United States patent 5,636, 027 employs two measurement systems in order to compensate for the error based on a wedge form and tipping of the measurement object. The device of Spengler employs a laser 10 and 20 as a light source. The laser beams of this construction impinge directly onto the object to be measured without further optical treatment such as for example being widened followed by focusing and the laser beams are directly reflected at the object to be measured onto the opto-electronic sensor, without that an image of the reflections occurs based on an imaging system inserted into the path of the beams. In contrast to Spengler, the present invention allows an imaging of the reflections based on an imaging system including the objective (14; 15) or the objectives (24; 25) inserted into the path of the beam. A measure for the wall thickness of the object to be measured is furnished according to the present invention by the distances of the reflexes of each one of the two reflex pairs.

The device according to United States patent 5,636,027 to Spengler employs laser beams and for this reason is also not in a position to deliver reliably reflections at uneven, scarred surfaces of container glass. The device according to the Spengler reference does also not have the corresponding optics for a face like expansion of the beam or for the generation of reflex images on the sensors as does the present Invention. For this reason the construction of Spengler is unsuitable for wall thickness measurements at container glass.

Takamasa discloses the use of lenses 3, 7 (see Figure) for shaping the light beams, for the purpose of making contactless measurement of the thickness of an object made of transparent material. Also, the use of various types of light sources for the purpose of making contactless measurement of the thickness of an object made of transparent material is commonly known in the art.

In view of Takamasa' teachings and what is commonly known in the art, according to the Office Action it would have been obvious to one of ordinary skills in the art at the time the invention was made to incorporate refractive elements such as lenses for beam shaping and provide alternate/substitute light sources into Spengler's apparatus/method for making contactless measurement of the thickness of an object made of transparent material. Accordingly, such incorporation/substitution would have constituted an alternative means/obvious engineering expedience for one of ordinary skill in the art.

The device according to Japanese patent 58,022,902 to Takamasa also employs a laser as a light source. In fact the laser beam of the Japanese patent 58, 022, 902 is deformed to a line by a cylindrical lens 7 in order to be able to perform the measurement also with curved surfaces, for example television panels. A face like expansion of the beam does not occur however according to the Japanese patent 58, 022,902. At the same time the laser beam is subdivided into two beams by a beam divider, wherein the two beams impinge onto the measurement object coming from oppositely disposed directions. Based on the sharp bundling of the laser beam and the employment of laser light, a determination of the wall thickness can be performed also only out of two reflection beam pairs, wherein the laser light impinges under only a single inclination angle onto the measurement object. Therefore this construction according to the Japanese patent is unsuitable for a measurement of container glass with the rough, uneven surfaces typical for container glass.

The Office Action further states under 13. that the device and a method for the contact less measurement of the thickness of measurement element 1 is disclosed in the Japanese patent 58, 022,902 to Takamasa, wherein the laser 2 with a beam expansion lens 7 is furnished as an illuminating surface. The lens 7 is furnished allegedly in the Japanese patent reference in order to be able to perform correctly the measurement of the thickness despite uneven surfaces of the measurement object.

It can be recognized that the lens 7 of the Japanese patent reference is a cylindrical lens and therefore no expansion of the beam can occur in the sense of the present invention,

but only a pulling apart of the laser beam to form a line. The illuminating surface 11 and 21 of the present Invention and the point shaped and line shaped expanded laser 2 in the reference Takamasa are not alternatives of equal value as the office action tries to make belief.

An essential differentiating feature of the present Invention relative to the reference Takamasa is furthermore that the teaching of the reference Takamasa fails to include a further lens, wherein the further lens focuses the expanded beam onto the measurement object, which is performed according to the present invention with the lenses 14 and 24.

This cylinder lens 7 according to the reference Takamasa performs a beam expansion only in a single direction and transforms the point shape laser beam out of the He-Ne-laser light source 2 into a line. This accomplishes that based on a line shaped beam only parts of the reflections of the laser lines can impinge into the receiving optics 3 and 3' even in case of curved surfaces, where for example TV panels form the measurement object.

Therefore the arrangement according to the reference Takamasa is also unsuitable for a measurement of the wall thickness of container glass having the rough, uneven surfaces typical for container glass.

The Office Action recognizes that the property of a diffuse radiating illuminating surface cannot be achieved by a pulling apart of the laser point to a line with the cylinder lens of

the Japanese patent reference, wherein the illuminating surface is expressly claimed in claim 1 of the present application.

The first illuminating surface 11 emits light bundles in many different emission directions diffuse like a surface in two dimensions according to the present Invention. These light bundles are expanded by the lens 12, are deflected by the semi permeable mirror 13 and are in the following focused onto the measurement object by the lens 14. This way light bundles from the most different directions fall onto the measurement object. An image of the illuminating face 11 is thereby generated on the measurement object. These reflections are imaged onto the line sensor 26 by the two objectives 24 and 25. The objectives 24 and 25 generate in each case an image on the line sensor 26 from the reflections. It is accomplished that the measurement object is impinged by a large bandwidth of light bundles, which fall onto the container glass surface from the most different angles of incidence and represent an illuminating measurement surface. This assures that parts of the path of the beams are always reflected back into the receiving optics despite the scarred, uneven surface of the measurement object, even then when other bundles are eliminated out of the beam path based on these surface defects. Thus always reflections from the first opto-electronic image resolving sensor 26 are imaged as two reflection images.

This is an important aspect of the Invention. The same process occurs by imaging from a second illuminating surface 21 simultaneously several light bundles of the diffuse light emitted in most different directions, wherein the light bundles are collimated and are

focused and lead together again to a second illuminating measurement face on the surface of the measurement object 1 such that the directions of incidence of these beam bundles correspond to the deflection directions of the reflected beams from the first illuminating face 11.

The reflected beams from the second illuminating measurement surface, which reflected beams are also emitted from the front side and rear side 1.1 and 1.2 of the measurement object, are imaged onto the second opto-electronic image resolving sensor 16 as two reflected images.

The controller 3 connected downstream forms the average value of the distances of the in each case two reflection images on each of the two opto-electronic image resolving sensors 26,16 as a measure for the wall thickness of the measurement object 1. (In total 2 x 2 reflection images of the measurement surface).

It can be recognized that all known documents out of the state-of-the-art and also the United States patent 5,636,027 and the Japanese patent 58, 022,902 to not provide an image of reflections and in particular not a focused image onto the light sensitive sensor. The known constructions always direct the laser beam onto the surface of the measurement object and receive the reflection immediately onto the light sensitive sensor without performing an imaging of the reflections.

It is further disadvantageous in the known constructions that in case of heavily wedged or curved surfaces and simultaneously a limited aperture of the receiving objective then the reflections cannot be imaged onto the sensor. The reflections are reflected back into a direction disposed outside of the opening of the receiving optics and the reflections are thereby not available for measurement value formation.

An exact comparison of the methods taught in these patents Spengler and Takamasa with devices for contact less measurement according to the essence of the present application shows that the methods of the state-of-the-art and the present application method are based on different optical measurement principles (methods) and the therefore have a different optical construction.

The diffuse face like light out of the illuminating surfaces of the present Invention and the directed laser beam or the laser beam expanded into a line shape by beam expansion according to Spengler and Takamasa are in no way alternatives of the same value. The known optical construction enables only the line shaped beam expansion, but in no way a surface shaped beam expansion.

Always an illuminating measurement surface is generated on the measurement object and in each case two reflection images are formed on the two sensors by the optical construction (imaging optics with two objectives) according to the present invention based on the collimated and in the following focused beam bundles of the illuminating faces according to the present invention.

The Office Action alleges that the claims of the present application are obvious in view of the art. The Office Action writes that the invention represents for person of ordinary skill in the art an alternative method and an alternative method/means to the recited method and the optical construction according to U.S. patent reference Spengler and to the Japanese patent reference Takamasa.

Applicant respectfully submits that there is nothing wrong with patenting alternative methods.

However in addition, a detailed comparison of the optical construction and of the optical effects shows that the present Invention is unobvious over the references Spengler and Takamasa.

The use of point shaped or line shaped light sources and of a cylindrical lense is known, however in clear contrast a use of light surfaces is not known. Applicant submits that the optical construction, the kind and arrangement of lenses and their effects relative to each other and relative to the measurement object are not resolved alternatively for light faces, but such solution is generated only by the presence of and by the overcoming of an inventive step.

The references Spengler and to Takamasa represent a parallel incidence of the laser beams on the measurement object, such that the sensors are impinged always by the two reflected beams of a laser beam, such that the two reflected beams of a laser beam impact always onto the sensors and such that no face like image of the measurement surface is

generated. Therefore the essence of the present Invention is not known, not be liable or not obvious in view of the references Spengler and Takamasa.

A combination of the references Spengler and Takamasa with corresponding effects of their constructions is not acceptable or obvious to a person of ordinary skill in the art, since any combination of the state-of-the-art does not accomplish the illuminating surface like effect obtained according to the essence of the present Invention.

Claims 1 and 2 of the present application contain a method and a device, which method and device contain apparently known features and means, which however are new and inventive and without alternative in their effect and their results. The object of the present at invention would not be achievable with the means taught in the references Spengler and Takamasa.

The optical measurement principal and the optical construction of the present invention are not known from the references Spengler and Takamasa such that the object to be resolved could only be obtained by an inventive step. The applicant therefore is of the opinion that the subject matter of the present invention is new and nonobvious.

It will be recognized that the surface like measurement principle with the diffuse illuminating face and the generation of reflected images according to the present invention clearly show of the technical and creative achievement of the applicants and that the United States patent reference Spengler and the Japanese patent reference

Takamasa do not provide any suggestion for the solution according to the present application.

The point shaped and line shaped measurement principle according to the United States patent reference and the Japanese patent reference does not represent an alternative for the inventive face shaped measurement principle. The face shaped measurement principle according to claim 1 and the face shaped imaging -- measurement optics according to claim 2 are new in their application and effect and are not alternatively obvious for a person of ordinary skill in the art, but only be derivable by the presence of an inventive step.

Reconsideration of all outstanding rejections is respectfully requested.

Entry of the present amendment is respectfully requested. All claims as presently submitted are deemed to be in form for allowance and an early notice of allowance is earnestly solicited.

Respectfully submitted,

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